

Online Tour Booking using Fuzzy Decision Making Method

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ABSTRACT

Nowadays all people are using websites to make their tour plans and to book hotels. Instead of approaching traditional travel agents, websites provide round the clock service at no cost. This paper proposes the Tourism guide website using Artificial Intelligence concept Fuzzy Logic. The Artificial Intelligence based website is more user friendly and understands the requirements of customer and helps the customer to make apt decision for making tour plans and book hotels and eating nice foods in various places. This paper proposes Fuzzy Logic based decision making to learn the mentality of customers and provides useful personalized and customized suggestions for tourists. The proposed system provides virtual tour to help the tourist for choosing the perfect tourist destinations. The proposed online system also provides a detailed itinerary for tourist spot selected by the traveller.

KEYWORDS: Fuzzy Logic; Fuzzy Decision Making; ICT; Fuzzy Set

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1. INTRODUCTION

In corporation of ICTs allows tourism companies and organizations to take advantage of intranets in order to reorganize internal processes, extranets in order to develop transactions with trusted partners, and the Internet in order to easily communicate with all the stakeholders. Use of ICTs allows for combining customer-relationship management and supply chain management into a single source that facilitates a variety of operations – product selection, ordering, fulfilment, tracking, payment and reporting, which are all performed with one easy-to-use tool. For the past ten years tourism achieved considerable growth and its role in the world economy has increased. it's often called economic and social phenomenon of 20th century in the scientific and popular literature. People love to travel. For travelling, a person must select the destination city. After selecting he/she must decide the places which they want to visit such as resorts, amusement parks, art gallery, restaurants etc.

This work basically concentrates on designing systems that provide us the short description about the places so that we can decide which place we want to visit. Decision Support Systems (DSS) are useful for business organizations for making right decision at the right time. A DSS Software supports the managers of any organization in the decision making process. DSS tool takes input from users past business experience or real time business data to solve any decision making problem. Intelligent Decision making systems make use of Artificial Intelligence concepts and provides solutions like an expert in the specific field. Many Decision Support Systems are implemented in the field like Medicine, purchase, sales, agriculture and provide real time

intelligent decisions like our human brain. Nowadays Smart phones become like an essential organ of human being. Online match making websites are used by today's youngsters and also adults who are still single and seeking for a soul mate. So matchmaking system is a useful source for them to get a perfect match in today's life. Since the available online match making websites are not providing proper and perfect match for males as well as females, we propose Android App based Decision Making System using Fuzzy Logic.

2. LITERATURE REVIEW

In [1], KaijianHuang and Junwu Zhu, 2015 implemented research design of intelligent tourist guide system and development of app by using shortest path algorithm. In [2], Owaied, H. H., and Farhan, H., A. 2011 implemented a model for intelligence tourism guide system by using knowledge based system. In [3], Ping-Teng Chang and Lung-Ting Hung, 2015 proposed an improved fuzzy approach for medical diagnosis. In [4], Sonja Zlatanavo and Jovan Popescu, 2019 did research on current application of artificial intelligence in tourism and hospitality by using chat bots. In [5], Sai Ganga, R *et al*, 2018 implemented system for intelligence tourist information using machine learning techniques by using natural language processing and machine learning. In [6], Shanshan Wang *et al*, 2012, proposed a financial decision making using fuzzy logic and introduced fuzzy propositional logic for financial decision making. They developed a semantic model for financial planning. In [7], Shuhadah Othman and Etienne Schneider, 2010 presented the use of fuzzy rules for stock brokering. In

[8], Tirth Shah et al, 2017 implemented Intelligent Tourist Information System by using the concept of knowledge base and shortest path algorithm.

3. Basic Concepts of a fuzzy set

In the year 1965, the Fuzzy Logic concept was introduced by LotfiZadeh in his seminal paper [11].

Let $U = \{u_1, u_2, \dots, u_n\}$. A fuzzy set N can be like following equation (1).

$$N = \{u_i, f_N(u_i) \mid u_i \in U\} \quad (1)$$

N and L are Fuzzy sets universe of discourse U , $U = \{u_1, u_2, \dots, u_n\}$ and let f_N and f_L member functions of N and L , respectively, where $f_N : U \rightarrow [0,1]$,

$$f_L : U \rightarrow [0,1], N = \{u_i, f_N(u_i) \mid u_i \in U\}, \text{ and}$$

$$L = \{u_i, f_L(u_i) \mid u_i \in U\}$$

$$N \cup L = \{u_i, f_{N \cup L}(u_i) \mid f_{N \cup L}(u_i) = \max(f_N(u_i), f_L(u_i)), u_i \in U\} \quad (2)$$

$$N \cap L = \{u_i, f_{N \cap L}(u_i) \mid f_{N \cap L}(u_i) = \min(f_N(u_i), f_L(u_i)), u_i \in U\} \quad (3)$$

$|N|$ value will be obtained from the equation (4)

$$|N| = \sum_{i=1}^n f_N(u_i) \quad (4)$$

E and L are triangular fuzzy sets

$$E = (a_1, b_1, c_1)$$

$$L = (a_2, b_2, c_2)$$

1. Fuzzy Addition \oplus :

$$E \oplus L = (a_1, b_1, c_1) \oplus (a_2, b_2, c_2) \quad (5)$$

$$= (a_1 + a_2, b_1 + b_2, c_1 + c_2).$$

2. Fuzzy Numbers Subtraction:

$$E \ominus L = (a_1, b_1, c_1) \ominus (a_2, b_2, c_2) \quad (6)$$

$$= (a_1 - c_2, b_1 - b_2, c_1 - a_2).$$

3. Fuzzy Numbers Multiplication \otimes :

$$E \otimes L = (a_1, b_1, c_1) \otimes (a_2, b_2, c_2) \quad (7)$$

$$= (a_1 \times a_2, b_1 \times b_2, c_1 \times c_2)$$

4. Fuzzy Numbers Division \oslash :

$$E \oslash L = (a_1, b_1, c_1) \oslash (a_2, b_2, c_2) \quad (8)$$

$$= (a_1/c_2, b_1/b_2, c_1/a_2).$$

4. Fuzzy Decision Making Method

Tourism combined with fuzzy knowledge and e-commerce technology will create further expansion of this industry especially in better addressing customers' needs and tastes. The aim of this paper is to introduce an electronic tourism system (e-tourism) based on fuzzy decision making method. This electronic system is in the form of a website, which tourists can use to find an appropriate tour package by inputting data related to their interests and needs. Representing the decision problem and evaluating the criteria are the two steps in the Fuzzy Decision Support System. We have to identify clearly the decision making criteria for Fuzzy Decision Support System, then only the system will provide correct decision.

In the decision-making step, first of all we need to linguistic variables depend upon the importance given by the specific

user. Secondly, we need to evaluate weight value for the specific criteria. Thirdly, we need to find the sum of all weights for all criteria. The linguistic variable represents the numeric weight of the decision criteria. We need to find out the fuzzy membership function for each and every criteria of match making process. Fuzzy membership function will provide the fuzzy values from 0 to 1. We can identify the specific criteria weight by analyzing the fuzzy membership values. In the Fuzzy Decision making system for Tours, We use the linguistic variables for the match making criteria.

The following fuzzy membership function for the triangular fuzzy set is used in our match making process. The triangular Fuzzy membership values are calculated depends upon the importance given by the male or female partner. Although Trapezoidal Fuzzy membership function is also available, we strongly feel that Triangular fuzzy membership functions are most suitable for Fuzzy Decision Making process for tours.

$$f_m(x) = \begin{cases} \frac{(x-a)}{(b-a)}, & a \leq x \leq b, \\ \frac{(x-c)}{(b-c)}, & b \leq x \leq c, \\ 0, & \text{otherwise} \end{cases} \quad (9)$$

W_t is the triangular fuzzy number of the C_t , F_t be the fuzzy membership value of criterion C_t , and X_t be the FSW of the decision criterion C_t that is obtained by fuzzy multiplication of F_t and W_t . the fuzzy arithmetic operations are applied to calculate the FSW value for all the criteria considered and calculate CFV value [3]. (Fuzzy arithmetic operations are discussed in section 2).

Let say Fuzzy triangular number weight of the criterion C_1 be (a_1, b_1, c_1) and Fuzzy membership set for the criterion C_1 be (F_i, F_i, F_i) of any applicant, FSW value X_i for the criterion C_1 is calculated as the following:

$$X_i = \frac{((a_1, b_1, c_1) \otimes (F_i, F_i, F_i))}{(a_1, b_1, c_1)} \quad (10)$$

For finding out the CFV for n criteria, the following formula can be applied.

$$CFV = \frac{\sum_{i=1}^n F_i \cdot W_i}{\sum_{i=1}^n W_i} \quad (11)$$

Substituting F_i and W_i with triangular fuzzy numbers, we can calculate CFV triangular value all the criteria of Decision making. After calculating CFV triangular values for all the criteria, FFV is calculated aggregating both IFV and CFV triangular values depends upon the weights assigned respectively by the intelligent tour website administrator the following formula. [9].

$$FFV = \frac{(CFV \otimes W_1) \oplus (IFV \otimes W_2)}{(W_1 \oplus W_2)} \quad (12)$$

In order to defuzzify the fuzzy sets value, we must use any defuzzification method. There are various defuzzification methods are available in the Fuzzy sets. Defuzzification is done using the formula (13).

$$DEF(K) = \frac{(x + 2y + z)}{4} \quad (13)$$

Finally, Online system administrator can send sms or email of fuzzy decision making to the traveller according to the defuzzified fuzzy value.

5. APPLICATION

The proposed Fuzzy Decision making is implemented for making decision in fixing the tour according to their own requirements.

We implement this Fuzzy Decision Support System is to select the suitable tour package for the registered travellers in the database. We fix the following decision criteria for the Fuzzy match making system: $C = \{C_1, C_2, C_3, C_4\}$, where C_1 = budget, C_2 = places, C_3 = transport, C_4 = stay option. The decision criteria are defined as follows: $C = \{\text{budget, places, transport, stay option}\}$.

The linguistic variables of the decision criteria are used. Linguistic variables like very low, very high, medium are associated with the respective triangular fuzzy sets. Fuzzy triangular set values are obtained using the Equation (11) and Equation (12). In order to identify the suitable tour packages, we take many criteria such as budget, places, transport, stay option are considered. Online Fuzzy Decision Making system is explained in the following figure.

6. Online Decision Making Process using Fuzzy logic

In the FDM model, first of all, the fuzzy triangular value will be calculated for all criteria according to the linguistic values assigned by the traveller for each criterion. Then Cumulative Fuzzy Value (CFV) will be calculated for each traveler. Then, the FDM system will suggest the suitable tour package for the traveller. Then the FDM System will give Cumulative Fuzzy Values (CFV) according to the perfect matching. Finally, the CFV triangular values will be defuzzified by equation (13). The traveler has to give linguistic weights for all the criteria as shown in the screen. (Fig 1 and Fig 2). The Fuzzy Decision Making system administrator will suggest the suitable tour package for the traveller according to the requirements.

Fig 1. Online Fuzzy Decision Making System for Tours

Fig 2. Online Fuzzy Decision Making System for Tours

7. CONCLUSION

This paper proposes a system which gives best places to travel according to user's point of interest. It gives most exact places on the basis of their requirements using Fuzzy Decision Making. Intelligent tour website is developed for match making process using Fuzzy decision making. Triangular Fuzzy sets concepts and Fuzzy arithmetic are working background in the online tours and travels website. This online Fuzzy Decision Making application will be useful for travellers who are in a confusion to fix their tour packages. This intelligent website is easy to use and will suggest the most suitable travel package for travelers using their own criteria like budget, tour places, transport, and stay options. This intelligent website consider the various criteria for travellers based on linguistic term based fuzzy weights depends upon the importance given by the traveller. Since the website is using Artificial Intelligence Concept Fuzzy Logic, it mimics the human brain-oriented decision making for selecting the suitable tour package.

REFERENCES

- [1] Kaijian Huang, JunwuZhu, "Research Design of Intelligent Tourist Guide System and Development of APP", Proceedings of International conference on education, Management and Computing Technology, 2015
- [2] Owaied, H H, Farhan, H A., NidalHawamdeh, Al Okialy, A Model For Intelligent Tourist Guide System, Journal of Applied Sciences, Vol. 11, Issue 2, 2011
- [3] Ping-Teng Chang, Lung-Ting Hung, "discussion on fuzzy decision making based on fuzzy number and compositional rule of inference", Journal of Operations Research, Vol. 25, No. 2, 2015.
- [4] Sonja Zlatanavo, Jovan Popesku, Current Application Of Artificial Intelligence In Tourism And Hospitality, proceedings of International Scientific Conference on Information Technology and Data Related Research, 2019
- [5] SaiGanga, R, Chandra Prakash Reddy P, Chandran Mohan BIn 2018, "System For Intelligence Tourist Information Using Machine Learning Techniques" Proceedings of International Scientific Conference On Information Technology And Data Related Research, 2019
- [6] Shanshan Wang, Zhenghua Pan, Lei Yang, "Fuzzy Decision Making Based on Fuzzy Logic with Contradictory Negation, Opposite Negation and Medium Negation", in proceedings of International Conference on Artificial Intelligence and Computational Intelligence, 2012.
- [7] Shuhadah Othman, Etienne Schneider, "Decision making using fuzzy logic for stock trading", in proceedings of IEEE International Symposium on Information Technology, 2010.
- [8] Tirth Shah, Sonal Rami, Ayesha Shaikh, "Intelligent Tourist Information System", International Journal of Computer Applications", Vol. 175, No. 3, 2017.